Vision - Potential

Vision Within Every Instructor - Potential Within Every Student

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[1] Contemporary Problems

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One of the greatest differences between teaching College Algebra in a refocused manner compared to a traditional one for me is the inclusion of problems immersed in a real-life context. Students always seem hesitant towards embracing the dreaded word problems. I believe part of this is attributed to the fact the traditional curriculum doesn't emphasize them. They always seem to be the problems numbered 100 and beyond, and do not seem to be a major focus of what is being learned. The other reason for this tepid view towards word problems is they are often given to students in contrived situations that the students don't see as applicable or even remotely connecting to someone's real-life.

In my classes, I like to include non-standard problems, where students are able to see how mathematics would be helpful in modeling the given situation, and then use that mathematical model to answer important questions one might pose if they were interested in finding out more about the situation. Authors of refocused curriculums, such as Don Small, have given instructors resources to draw from in order to include these types of problems in their classes. Often times though, I find myself drawing from my own life experiences and situated contexts for development of problems to include in my classes.

This past summer I was reading a copy of a newsletter I subscribe to, "Las Vegas Advisor", which discussed the effect gas prices were having on the Vegas economy. As I was reading the article, it made me think that here is a situation based in real-life that my students in College Algebra would be able to relate with, while at the same time would allow them to develop important mathematical content. Students would be able to understand the meaning behind the mathematics being developed, as most of them or their parents would be experiencing the same type of feelings at the pump. After reading the article I did a little searching at www.aaa.com and was able to develop the following problems.

1. Typically, a quarter to a third of all of the visitors to city of Las Vegas come from Southern California. As gas prices have risen, the average number of vehicles traveling from California to Nevada along I-15 has decreased. In the first third of the year 2008, approximately 35,700 cars traveled that route

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daily, while the average gas price in Southern California was $3.46. Residents from Southern California stated that gas would have to reach $5.73 per gallon for them to quit driving to Las Vegas altogether.

a. Create a linear model where the average number of vehicles traveling from California to Nevada along I-15 is dependent on the average gas price in Southern California.

b. Interpret the meaning of the slope in your model.

c. If gas reached $5.25 per gallon, based on your model how many cars would travel that route daily?

d. If the average number of cars traveling that route dropped to 31,300; what would you expect the price of gas to be in Southern California based on your model

2. In 2005, Las Vegas visitors from Southern California stated that gas would have to reach $3.51 per gallon for them to quit driving to Las Vegas altogether. In 2008, the price to get Southern Californians to quit driving to Las Vegas rose to $5.73.

a. Assuming that price has grown exponentially over the three years, find a yearly growth factor for the price of gas which would make them not drive to Las Vegas over the three year period.

b. What is the yearly growth rate over the three year period?

c. Create an exponential model which depicts the price of gas that would cause Southern California residents to stop driving to Las Vegas dependent on time, where time is measured in years after 2005.

d. Use your model to calculate the price gas would have to rise to in Southern California to cause residents not to drive to Las Vegas in 2010.

e. According to your model, in what year would the gas price that causes South Californians not to drive to Las Vegas reach $11.01?

3. In the first third of the year in 2008 approximately 35,700 cars traveled from California to Nevada on I-15 each day. This was a 5% decrease from the previous year.

a. Based on this information, how many cars traveled this route daily in the first third of the year in 2007?

b. Assuming there is an 8% decrease from 2008 to 2009, how many cars will travel that route daily in the first third of the year in 2009?

My next example was based on an actual in class experience. Each class period I would bring my laptop with me to teach back-to-back classes . As the semester wore on, my battery life became less and less, to the point I wasn't able to make it through both classes simply on my battery alone. This became an interesting problem to me, and I shared it with the class. It led me to create the following contextually-based problem we could use in class to once again develop relevant mathematics; while at the same time answering the question of the amount of battery life I should expect in the near future.

4. When you buy a brand new laptop, its fully charged battery allows you to work a maximum of 2 hours and 15 minutes before having to charge it again. After each month passes, you record the maximum life in your battery, as shown in the table below.

Months after Purchase	Maximum Life of Laptop Battery (min.)
0	135.0
1	129.6
2	124.4
3	119.4
4	114.6

a. Create an exponential model where the maximum amount of battery life for the laptop (measured in minutes) is dependent on the age of the battery (measured in months).

b. What percentage of the battery's life do you lose each month?

c. What is the maximum amount of work time you can expect from this battery if it is 30 months old?

d. According to your model, how old is your battery if you can only use it to work 20 minutes before having to charge it?

e. Draw a graph of your model over the domain [0, 48]. Label your axes appropriately and include at least three points.

My final example exhibits my love of playing cards outside the classroom. Not

every student in the class will be a poker player, but many have probably watched on television and have a some understanding of the game.

5. When playing the game Texas Hold 'em poker each player starts with two cards. If there are only two players, then you have a strong advantage if you are dealt a pair of matching cards and your opponent is dealt a pair of matching but smaller cards. For example you might be dealt a pair of 10's and your opponent a pair of 7s'. In this scenario you have approximately an 80% chance of winning the hand. Thus many players consider it a "bad beat" when they lose in a scenario like this. Let's explore how likely it is for you to repeatedly win in this situation if it occurs multiple times in a row?

a. Create a model which represents your percentage of winning this scenario every time it occurs as a function of the number of times you play in this scenario.

b. What is an appropriate domain and range for your function? Are there any asymptotes in this model? Explain.

c. What is your chance of winning this scenario 3 times in a row?

d. How many of these scenarios could you play in a row and still have better than a 20% chance of winning them all?

The point is, there are many mathematical situations that will present themselves in everyday life, which with a little work could become a great situated problem to ask your refocused algebra class to solve. By sharing with them where the problem comes from, it gives them better insight and initiative to explore themselves where the next mathematical situation will present itself.

Sources for problems 1, 2, & 3:

a. Las Vegas Advisor Newsletter, August, 2008

b. http://www.aaa.com

[2] Wine/Water Mixing Problem

From Wikipedia, the free encyclopedia

In the wine/water mixing problem, one starts with two containers, the first holding wine and the second an equal volume of water. A cup of wine is taken from the wine container and added to the water. A cup of the wine/water mixture is then returned to the wine container, so that the volumes in the containers are again equal. The question is then posed—which of the two mixtures is purer? (That is, compare the concentration

of wine in the first container to the concentration of water in the second container.)

In order to help understand the problem, consider two containers. The first holds 50 red balls and the second holds 50 blue balls. Take 10 red balls from the first container and mix them into the blue balls in the second container. Then transfer 10 balls from the second container to the first container. Compare the percentage of red balls in the first container to the percentage of blue balls in the second container. Would the comparison have been different if 30 balls had been moved? Explain.

This puzzle was mentioned by W. W. Rouse Ball in the third, 1896, edition of his book *Mathematical Recreations And Problems Of Past And Present Times*, and is said to have been a favorite problem of Lewis Carroll.

[3] Notices

1. The sixth edition of *Contemporary College Algebra: Data, Functions, Modeling* is now available. Contact Kathy Kilburg (563-584-6322, Kathhj_Kilburg@mcgraw-hill.com) for an examination copy.

2. The Joint Mathematics Meetings will be held in Washington, DC, January 5-8, 2009.

3. A Reunion of College Algebra Workshop Participants will be held on Tuesday evening in the Diplomat Room of the Omni Hotel from six to eight o'clock on January 6, 2009 as part of the Joint Mathematics Meetings in Washington, DC. Bill Haver and Don Small will facilitate the session. A box supper will be provided. Please contact Don Small by December 1 if you plan to attend in order to have an accurate account for food.

4. BBA National Conference

   We are feverishly continuing our plans to host our first, stand alone national conference to be held in Little Rock, Arkansas. The conference is entitled the 2008 Benjamin Banneker Conference on the Mathematics Teaching, Learning and Research of African American Students: Unlocking Doors of Excellence in Mathematics for African American Students. There are open possibilities to attend, present, sponsor or host a booth. For those of you who have been members of Banneker over the years, you will agree that this represents a major opportunity to showcase the diligent work of the organization on a national level. Early bird registration is available online at www.bannekermath.org/conferences/

   BBA2008.

5. The NAM MathFest XVIII will be held at Texas Southern University, November 13-15, 2008.

6. Past issues of the *Vision - Potential* Newsletter are available on our website: www.ContemporaryCollegeAlgebra.org.

7. Deadline for contributions to the January Newsletter is January 1, 2009. Opinion articles, suggestions for writing assignments, small group in-class activities, small group out-of-class projects, Queries, announcements, etc. are welcomed.

8. To subscribe to this Newsletter, write to Don Small, Department of Mathematics, U.S. Military Academy, West Point, NY 10996 or contact him via e-mail at don-small@usma.edu.